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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/586,581	07/19/2006	Tsuguo Fukuda	062697	6163

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EXAMINER	
CHAET, MARISSA W	

ART UNIT	PAPER NUMBER
1791	

MAIL DATE	DELIVERY MODE
01/09/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/586,581	FUKUDA ET AL.	
	Examiner	Art Unit	
	Marissa W. Chaet	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 8-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 8-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5-6, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. (US 6,270,569) in view of Usui et al. (US 2002/0197825).

Regarding claims 1-2, Shibata discloses a process for producing single crystals of GaN on a seed crystal substrate by a reaction between molten gallium retained in a container inside a crystal growth chamber and nitrogen gas, the process comprising: preparing an alloy melt of gallium; dipping the seed crystal substrate into the melt, the substrate including a crystal layer comprising of gallium; and epitaxially growing a single crystal film of the GaN at a temperature of 500-900°C on the surface of the substrate by the reaction at the surface of the substrate between gallium and nitrogen dissolving into the melt from a zone containing a nitrogen supply source above a surface of the melt. See col. 9, lines 20-37; col. 17, line 60 – col. 18, line 65.

Regarding claim 3, Shibata discloses forming the alloy melt with gallium and bismuth. See col. 18, lines 42-51.

Regarding claim 5, Shibata discloses ammonia as the nitrogen-containing compound gas. See abstract.

Regarding claim 6, Shibata discloses a sapphire substrate. See col. 9, line 60-65.

Regarding claim 9, Shibata discloses a substrate (16) attached to a lower end portion of a drive shaft (18). See Fig. 2; col. 9, lines 60-67.

Shibata does not disclose a catalytic metal in the process. However, Usui discloses adding a catalyst, such as platinum and iridium, to the substrate. See para. 81-88. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Shibata to provide a catalyst, such as in Usui, to accelerate the decomposition of a first semiconductor layer of a group III nitride. Furthermore, a catalytic metal having a mesh, stripes, or an open polka-dot pattern does not further limit the claim.

Claims 4, 8, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. (US 6,270,569) in view of Usui et al. (US 2002/0197825) and in further view of Kitaoka et al (US 2004/0144300).

Regarding claim 4, the combination of Shibata and Usui does not disclose a pressure between 0.1 and 0.15 MPa in the space containing the nitrogen supply. However, Kitaoka discloses a nitrogen gas atmosphere of between 1 to 50 atm, or 0.10 to 5.07 MPa. See para. 48. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combination of Shibata and Usui to provide a nitrogen gas atmosphere between 0.1 and 5 MPa, such as suggested in Kitaoka, to create an optimal environment for the reaction between the nitrogen gas and the molten Ga alloy.

Regarding claim 8, the combination of Shibata and Usui does not disclose a single crystal film represented by Al, Ga, In, and N. However, Kitaoka discloses a film having a composition formula of $Al_xGa_yIn_{1-x-y}N$ (wherein $0<=x<=1$, $0<=y<=1$, and $0<=1-x-y<=1$). See para. 50. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combination of Shibata and Usui to produce a film composing Al, Ga, In, and N, such as suggested in Kitaoka, to provide a substrate that has less variations in in-plane carrier concentration.

Regarding claim 10, the combination of Shibata and Usui does not disclose different temperature zones. However, Kitaoka discloses a crystal growth chamber with two temperature zones in the vertical direction. See Fig. 8, #83, 84; para. 89. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combination of Shibata and Usui to provide two different temperature zones, such as suggested in Kitaoka, to produce the different temperatures needed for melt preparation the crystal formation.

Regarding claim 11, the combination of Shibata and Usui does not disclose an increase of between 100 and 150°C between the temperature at which a metal forms an alloy with gallium and the temperature at which to prepare the alloy melt. However, Kitaoka discloses a temperature of 900°C to melt the raw materials and a lowered temperature of 800°C to bring the melt to a supersaturation state. See para. 66-67. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combination of Shibata and Usui to provide a lowered

temperature of 100°C, such as suggested in Kitaoka, to prepare the melt for the growth of GaN crystals.

Regarding claim 12, the combination of Shibata and Usui does not disclose a crystal film thickness of between 100 and 200 micrometers. However, Kitaoka discloses a crystal film thickiness of about 100 micrometers. See para. 32. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combination of Shibata and Usui to provide a film thickness of 100 micrometers, such as suggested in Kitaoka, to obtain crystals having high flatness and without facets.

Response to Arguments

Applicant's arguments filed November 8, 2007 have been fully considered but they are not persuasive.

Applicant argued that Shibata does not disclose a eutectic alloy melt of Ga. However, Shibata discloses a Ga alloy (a compound comprising Ga and Bi) and a reaction temperature of 700°C. See col. 18, lines 60-65. Because the alloy melts of Shibata and the instant invention comprise the same metals, the results are subsequently the same.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marissa W. Chaet whose telephone number is 571-272-8094. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra N. Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MWC
January 4, 2008

/Robert Kunemund/

Robert Kunemund

Primary Examiner

TC 1700